

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION



AUGUSTA
KENNEBEC CTY.
MAINTENANCE BUILDING
BOILER REPLACEMENT

24 CHILD STREET



MDOT Maintenance Building
24 Child Street

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Turner Building Science & Design, LLC

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ENGINEERS • BUILDING SCIENTISTS

PROJECT LOCATION	24 Child Street Augusta, Maine
PROGRAM AREA	Maintenance Building
OUTLINE OF WORK	Replacement of boilers, associated equipment, piping and controls

WIN 023924.00

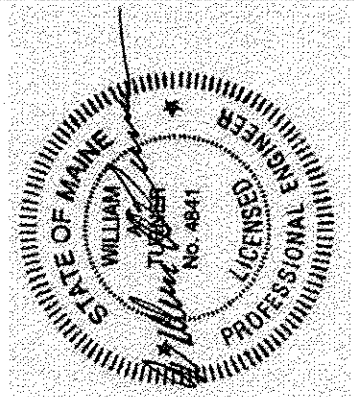
MAINTENANCE BUILDING
BOILER REPLACEMENT

TITLE SHEET

SHEET NUMBER

1

OF 12



SIGNATURE: *William J. Gray*
P.E. NUMBER: 4841
DATE: APRIL 18, 2018

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
APPROVED: *Scott Gray*
COMMISSIONER: *Scott Gray*
DATE: 4/18/19
CHIEF ENGINEER: *Scott Gray*
2-1-19

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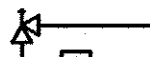
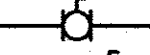
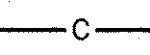
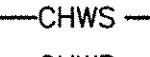
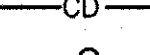
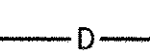
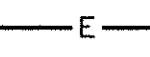
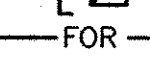
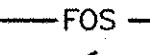
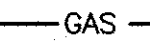
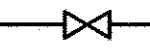
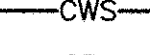
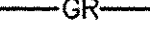
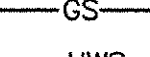
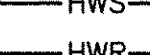
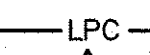
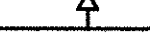
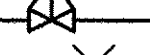
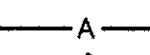
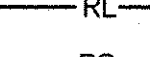
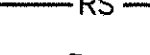
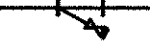
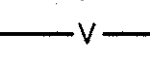
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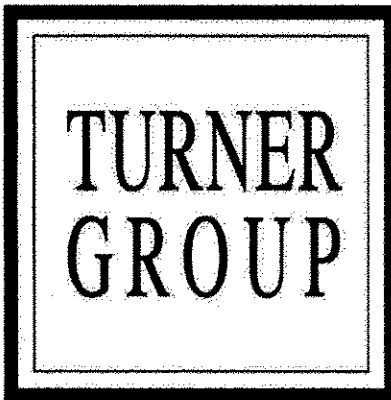
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ABBREVIATION				APPARATUS		PIPING	
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
AAV	AUTOMATIC AIR VENT	Nc	NOISE CRITERIA		SMOKE DETECTOR		ANGLE GLOBE VALVE
AC	AIR CONDITIONING	NC	NORMALLY CLOSED		PRESSURE GAUGE		AUTOMATIC AIR VENT (AAV)
ACV	AUTOMATIC CONTROL VALVE	NEC	NATIONAL ELECTRIC CODE		HUMIDISTAT		BACKFLOW PREVENTER
AD	ACCESS DOOR	NIC	NOT IN CONTRACT		HUMIDITY SENSOR		BALANCING VALVE
AFM	AIR FLOW MEASURING DEVICE	NO	NORMALLY OPEN		THERMOSTAT		BALL VALVE
AFF	ABOVE FINISHED FLOOR	NOM	NOMINAL		TEMPERATURE SENSOR		BALL VALVE WITH 3/4" GARDEN HOSE END & BRASS CAP
AHU	AIR HANDLING UNIT	OA	OUTSIDE AIR		MOTOR		BUCKET TRAP
AL	ACOUSTICAL LINING	OA	OUTSIDE AIR INTAKE		THERMOMETER (DIAL TYPE) IN WELL		BUTTERFLY VALVE
ALD	ACOUSTICALLY LINED DUCT	OB	OPPOSED BLADE DAMPER		CARBON DIOXIDE SENSOR		CAPPED PIPE
AP	ACCESS PANEL	OC	ON CENTER		DISCONNECT SWITCH		CHEMICAL TREATMENT
ASJ	ALL SERVICE JACKET	OED	OPEN-ENDED DUCT		MOTOR STARTER		CHILLED WATER SUPPLY
ATC	AUTOMATIC TEMPERATURE CONTROL	P	PUMP		CONTACTS		CHILLED WATER RETURN
BB	BASEBOARD RADIATION	PCF	POUNDS PER CUBIC FOOT		PRESSURE SENSOR		COMBINATION BALANCING, FLOW MEASURING, AND SHUT-OFF VALVE (CIRCUIT SETTER)
BDD	BACKDRAFT DAMPER	PD	PRESSURE DROP		TEMPERATURE SENSOR (PIPE OR DUCT)		CONDENSATE DRAIN
BFP	BACKFLOW PREVENTER	PEX	CROSSLINKED POLYETHYLENE		FLOW SENSOR		CONNECTION ON BOTTOM OF PIPE
BOD	BOTTOM OF DUCT	PRV	PRESSURE REDUCING VALVE		HUMIDITY SENSOR (DUCT)		CONNECTION ON TOP OF PIPE
BTU	BRITISH THERMAL UNIT	PSI	POUNDS PER SQUARE INCH		VARIABLE FREQUENCY DRIVE		DIRECTION OF FLOW
BTUH	BRITISH THERMAL UNIT PER HOUR	PSIG	POUNDS PER SQUARE INCH GAUGE		SWITCH		DIRECTION OF PITCH DOWNWARD
BTUH	BRITISH THERMAL UNIT PER HOUR	P/T	PRESSURE/TEMPERATURE TEST PORT		PARALLEL BLADE MOTORIZED DAMPER		DOMESTIC COLD WATER PIPING
CB	COUNTERBALANCED DAMPER	PVC	POLYVINYL CHLORIDE		OPPOSED BLADE MOTORIZED DAMPER		DRAIN LINE
CHWR	CHILLED WATER RETURN	R	RETURN	EQUIPMENT TAGS			ELECTRICAL LINE
CHWS	CHILLED WATER SUPPLY	RA	RETURN AIR		SHOWN IN HEXAGON BELOW REQUIRE ELECTRICAL POWER LOWER VALUE - EQUIPMENT TAG NUMBER UPPER VALUE - EQUIPMENT DESIGNATION		EXPANSION JOINT
CL	CENTERLINE	RH	RELATIVE HUMIDITY, REHEAT	LINE TYPES			FILL
CO	CARBON MONOXIDE	RL	REFRIGERANT LIQUID PIPING		EXISTING ITEM TO REMAIN		FLEXIBLE CONNECTION
CO2	CARBON DIOXIDE	RP	RADIANT PANEL		EXISTING ITEM TO BE REMOVED		FLOAT & THERMOSTATIC TRAP
CPVC	CHLORINATED POLYVINYL CHLORIDE	RPM	REVOLUTIONS PER MINUTE		NEW ITEM		FUEL OIL RETURN
CU	CONDENSING UNIT	RS	REFRIGERANT SUCTION PIPING		HIDDEN ITEM		FUEL OIL SUPPLY
CUH	CABINET UNIT HEATER	RTU	ROOF TOP AIR CONDITIONING UNIT		CONTROL WIRING		FUSIBLE LINK VALVE
CV	CONSTANT VOLUME	S	SUPPLY	OTHER SYMBOLS			GAS PIPING
CFM	CUBIC FEET PER MINUTE	SA	SUPPLY AIR		BOILER		GATE OR BALL VALVE
CTE	CONNECT TO EXISTING	SF	SUPPLY FAN		BOILER PUMP (LOOP INJECTION)		GLOBE VALVE
CW	COLD WATER	SP	STATIC PRESSURE (IN. WG)		BOILER FEEDWATER PUMP (PACKAGE)		CONDENSATE WATER RETURN
CWR	CONDENSATE WATER RETURN	SQ. IN.	SQUARE INCHES		CONDENSATE RETURN PUMP (PACKAGE)		CONDENSATE WATER SUPPLY
CWS	CONDENSATE WATER SUPPLY	TOD	TOP OF DUCT	LINE TYPES			GLYCOL RETURN
D	DAMPER	TS	TEMPERATURE SENSOR		EXISTING ITEM TO REMAIN		GLYCOL SUPPLY
DB	DRY BULB TEMPERATURE, °F	TSP	TOTAL STATIC PRESSURE (IN. WG)		EXISTING ITEM TO BE REMOVED		HEATING WATER SUPPLY
dB	DECIBELS	TYP	TYPICAL		NEW ITEM		HEATING WATER RETURN
DEG	DEGREES	UH	UNIT HEATER		HIDDEN ITEM		LOW PRESSURE STEAM
DEG. F	DEGREES FAHRENHEIT	UTR	UP THROUGH ROOF		CONTROL WIRING		LOW PRESSURE CONDENSATE
DIA	DIAMETER	UV	UNIT VENTILATOR	OTHER SYMBOLS			MANUAL AIR VENT
DN	DOWN	VAV	VARIABLE AIR VOLUME		CONNECT TO EXISTING		NON-SLAM CHECK VALVE
DP	DEW POINT TEMPERATURE, °F	VD	VOLUME DAMPER		DIAMETER		OS&Y VALVE
DX	DIRECT EXPANSION	VFD	VARIABLE FREQUENCY DRIVE	OTHER SYMBOLS			PIPE ANCHOR
E	EXISTING	W	WATTS	OTHER SYMBOLS			PIPE DROP
EA	EXHAUST AIR	WB	WET BULB TEMPERATURE, °F	OTHER SYMBOLS			PIPE GUIDE
EAT	ENTERING AIR TEMPERATURE, °F	WC	WATER COLUMN	OTHER SYMBOLS			PIPE RISER
EBB	ELECTRIC BASEBOARD HEATER	WG	WATER GAUGE	OTHER SYMBOLS			PNEUMATIC AIR LINE
EC	ELECTRIC COIL, EVAPORATOR COIL	WHM	WELDED WIRE MESH	OTHER SYMBOLS			PRESSURE REDUCING VALVE
EDB	ENTERING DRY BULB	W/	WITH	OTHER SYMBOLS			PRESSURE/TEMPERATURE TEST PORT
EF	EXHAUST FAN			OTHER SYMBOLS			PUMP
EH	ELECTRIC HEATER			OTHER SYMBOLS			REFRIGERANT LIQUID
EL	EXPANSION LOOP			OTHER SYMBOLS			REFRIGERANT SUCTION
ESP	EXTERNAL STATIC PRESSURE (IN. WG)			OTHER SYMBOLS			REDUCER - CONCENTRIC
ETE	EXPANSION TANK			OTHER SYMBOLS			REDUCER - ECCENTRIC
EWB	ENTERING WET BULB			OTHER SYMBOLS			SAFETY VALVE OR PRESSURE RELIEF
EWI	ENTERING WATER TEMPERATURE, °F			OTHER SYMBOLS			SOLENOID VALVE
EX	EXPANSION TANK			OTHER SYMBOLS			SPRING CHECK VALVE
EXG	EXISTING			OTHER SYMBOLS			STRAINER (WITH 3/4" BLOW-OFF VALVE)
EXH	EXHAUST			OTHER SYMBOLS			SWING CHECK VALVE
EXIST	EXISTING			OTHER SYMBOLS			THERMOSTATIC TRAP
(E)	EXISTING			OTHER SYMBOLS			THREE-WAY AUTOMATIC CONTROL VALVE (ACV) ELECTRIC OR ELECTRONIC
F	FAHRENHEIT			OTHER SYMBOLS			TWO-WAY AUTOMATIC CONTROL VALVE (ACV) ELECTRIC OR ELECTRONIC
FC	FLEXIBLE CONNECTOR			OTHER SYMBOLS			UNION OR FLANGE
FD	FIRE DAMPER			OTHER SYMBOLS			VENT LINE
FLA	FILL LOAD AMPS			OTHER SYMBOLS			
FN	FURNACE			OTHER SYMBOLS			
FO	FLAT OVAL			OTHER SYMBOLS			
FPF	FINS PER FOOT			OTHER SYMBOLS			
FPI	FINS PER INCH			OTHER SYMBOLS			
FFM	FEET PER MINUTE			OTHER SYMBOLS			
FR	FRITURE RADIATION			OTHER SYMBOLS			
FSK	FOIL-SCRM-KRAFT			OTHER SYMBOLS			
FT	FEET			OTHER SYMBOLS			
FT WG	FEET WATER GAUGE			OTHER SYMBOLS			
F&T	FLOAT & THERMOSTATIC			OTHER SYMBOLS			
FTR	FIN TUBE RADIATION			OTHER SYMBOLS			
GAL	GALLONS			OTHER SYMBOLS			
GPH	GALLONS PER HOUR			OTHER SYMBOLS			
GPM	GALLONS PER MINUTE			OTHER SYMBOLS			
GSR	GEOTHERMAL SOURCE RETURN			OTHER SYMBOLS			
GSS	GEOTHERMAL SOURCE SUPPLY			OTHER SYMBOLS			
GWR	GLYCOL WATER RETURN			OTHER SYMBOLS			
GWS	GLYCOL WATER SUPPLY			OTHER SYMBOLS			
HC	HEATING COIL			OTHER SYMBOLS			
HG	HOT GAS PIPING			OTHER SYMBOLS			
HRU	HEAT RECOVERY UNIT			OTHER SYMBOLS			
HRV	HEAT RECOVERY VENTILATOR			OTHER SYMBOLS			
HWP	HOT WATER PUMP			OTHER SYMBOLS			
HWR	HEATING WATER RETURN			OTHER SYMBOLS			
HWS	HEATING WATER SUPPLY			OTHER SYMBOLS			
HP	HORSE POWER			OTHER SYMBOLS			
HW	HOT WATER			OTHER SYMBOLS			
I.D.	IRIS DAMPER			OTHER SYMBOLS			
IN.	INCHES			OTHER SYMBOLS			
IN. WG	INCHES WATER GAUGE			OTHER SYMBOLS			
IWH	INDIRECT WATER HEATER			OTHER SYMBOLS			
KW	KILOWATT			OTHER SYMBOLS			
L	LOUVER			OTHER SYMBOLS			
LAT	LEAVING AIR TEMPERATURE, °F			OTHER SYMBOLS			
LBS	POUNDS			OTHER SYMBOLS			
LDB	LEAVING DRY BULB, °F			OTHER SYMBOLS			
LF	LINEAR FEET			OTHER SYMBOLS			
LPC	LOW PRESSURE CONDENSATE			OTHER SYMBOLS			
LPS	LOW PRESSURE STEAM (15 PSIG OR LESS)			OTHER SYMBOLS			
LPCC	LOW PRESSURE CLEAN CONDENSATE			OTHER SYMBOLS			
LPCCS	LOW PRESSURE CLEAN STEAM (15 PSIG OR LESS)			OTHER SYMBOLS			
LWT	LEAVING WATER TEMPERATURE, °F			OTHER SYMBOLS			
MAX	MAXIMUM			OTHER SYMBOLS			
MBH	THOUSAND BTU PER HOUR			OTHER SYMBOLS			
MCA	MINIMUM CIRCUIT AMPACITY			OTHER SYMBOLS			
MCD	MOTORIZED DAMPER			OTHER SYMBOLS			
MFG	MANUFACTURING			OTHER SYMBOLS			
MFR	MANUFACTURER			OTHER SYMBOLS			
MIN	MINIMUM			OTHER SYMBOLS			
MOCP	MAXIMUM OVER CURRENT PROTECTION			OTHER SYMBOLS			
MUA	MAKE-UP AIR			OTHER SYMBOLS			

- ### GENERAL NOTES
- GENERAL NOTES, SYMBOLS LIST AND DETAILS ARE APPLICABLE TO DRAWINGS MARKED M#. SOME ABBREVIATIONS AND SYMBOLS MAY NOT BE APPLICABLE TO THIS PARTICULAR PROJECT - THEY ARE PROVIDED FOR GENERAL REFERENCE ONLY.
 - PLANS ARE NOT INTENDED TO SHOW EVERY DETAIL, DROP, RISE, OR FITTING. DUCT AND PIPING LOCATIONS INDICATED ARE APPROXIMATE. DETERMINE EXACT LOCATIONS IN THE FIELD.
 - COORDINATE WORK OF THIS DIVISION WITH THAT OF OTHER DIVISIONS.
 - COORDINATE WORK WITH THE TRADES INVOLVED. PROVIDE OFFSETS IN PIPING AROUND OBSTRUCTIONS AT NO ADDITIONAL COST TO THE OWNER.
 - VERIFY EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. FIELD VERIFY AND COORDINATE DIMENSIONS BEFORE FABRICATION.
 - INSTALL EQUIPMENT, PIPING AND DUCTWORK AS REQUIRED TO PROVIDE A VIBRATION-FREE INSTALLATION, AND TO FACILITATE EQUIPMENT ACCESS AS REQUIRED BY EQUIPMENT MANUFACTURER.
 - PITCH PIPING 1 INCH PER 20 FEET IN DIRECTION OF FLOW TO DRAINS AND VENTS.
 - PROVIDE VENTS AT HIGH POINTS IN PIPING SYSTEMS AND DRAIN VALVES AT LOW POINTS. MANUAL VENTS IN MAINS SHALL CONSIST OF A LINE-SIZED AIR CHAMBER, AN ELBOW DOWNWARD, AND BALL VALVE WITH GARDEN HOSE END AND BRASS GASKETED CAP.
 - INSULATE PIPING AS SPECIFIED. PERFORM TESTS SPECIFIED BEFORE INSULATING.
 - CONTROL WIRE AND CONDUIT SHALL COMPLY WITH NEC AND DIVISION 26 ELECTRICAL SPECIFICATIONS.
 - PLUMBING WORK: IN ACCORDANCE WITH STATE AND LOCAL CODES.
 - PROVIDE AN AIR GAP OR BREAK AS REQUIRED BY CODE ON EQUIPMENT DRAINS PIPED TO FLOOR DRAINS OR OTHER RECEPTORS.



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KEY PLAN:

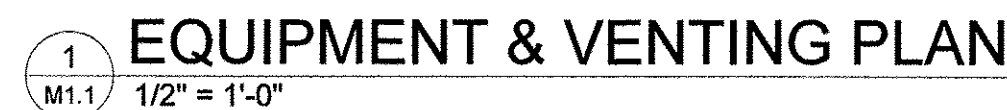
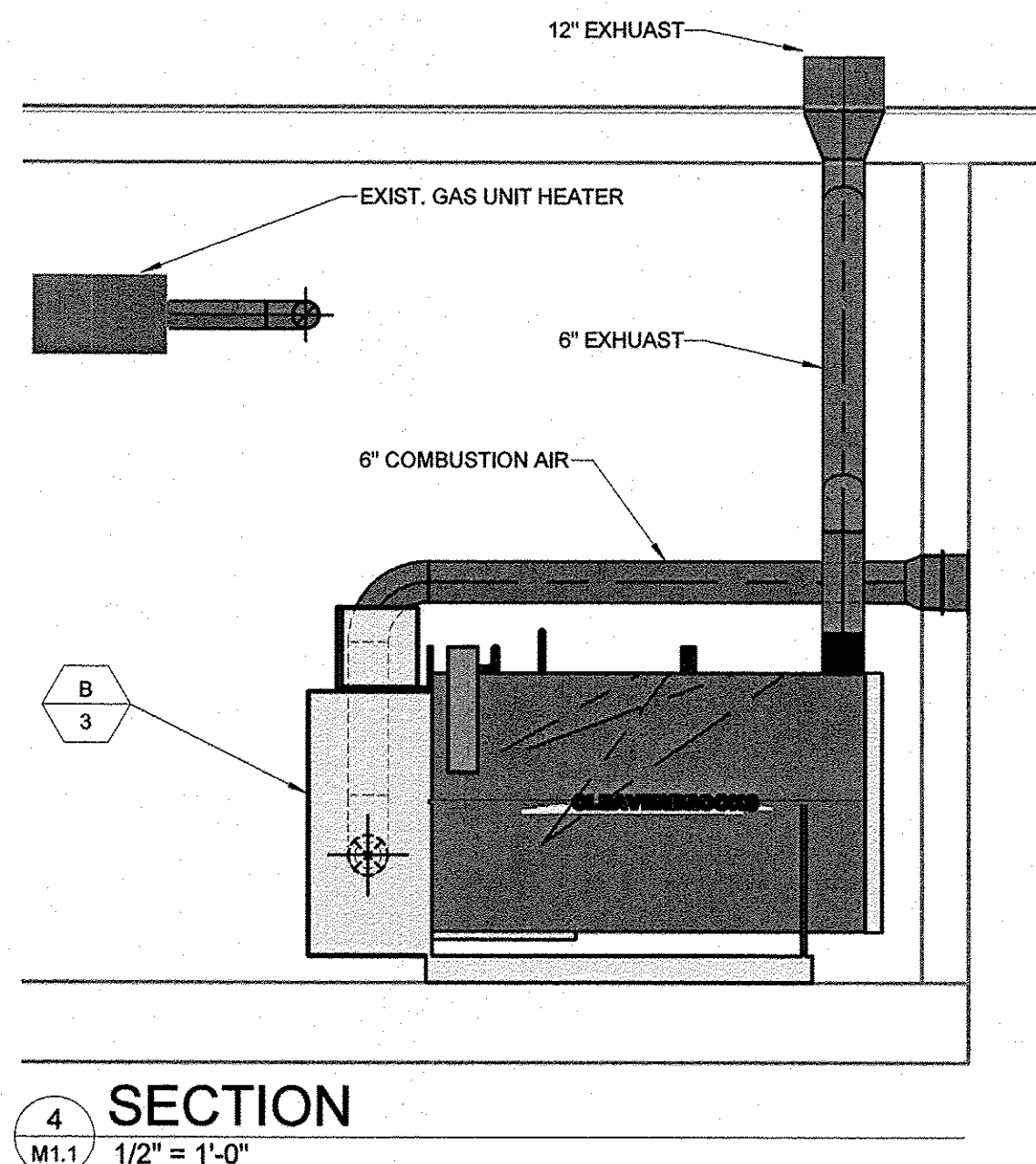
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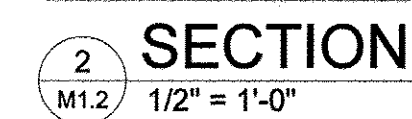
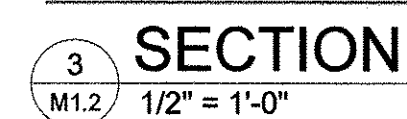
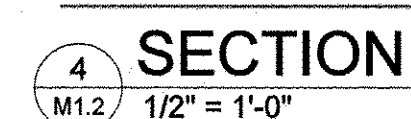
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MDOT MAINT

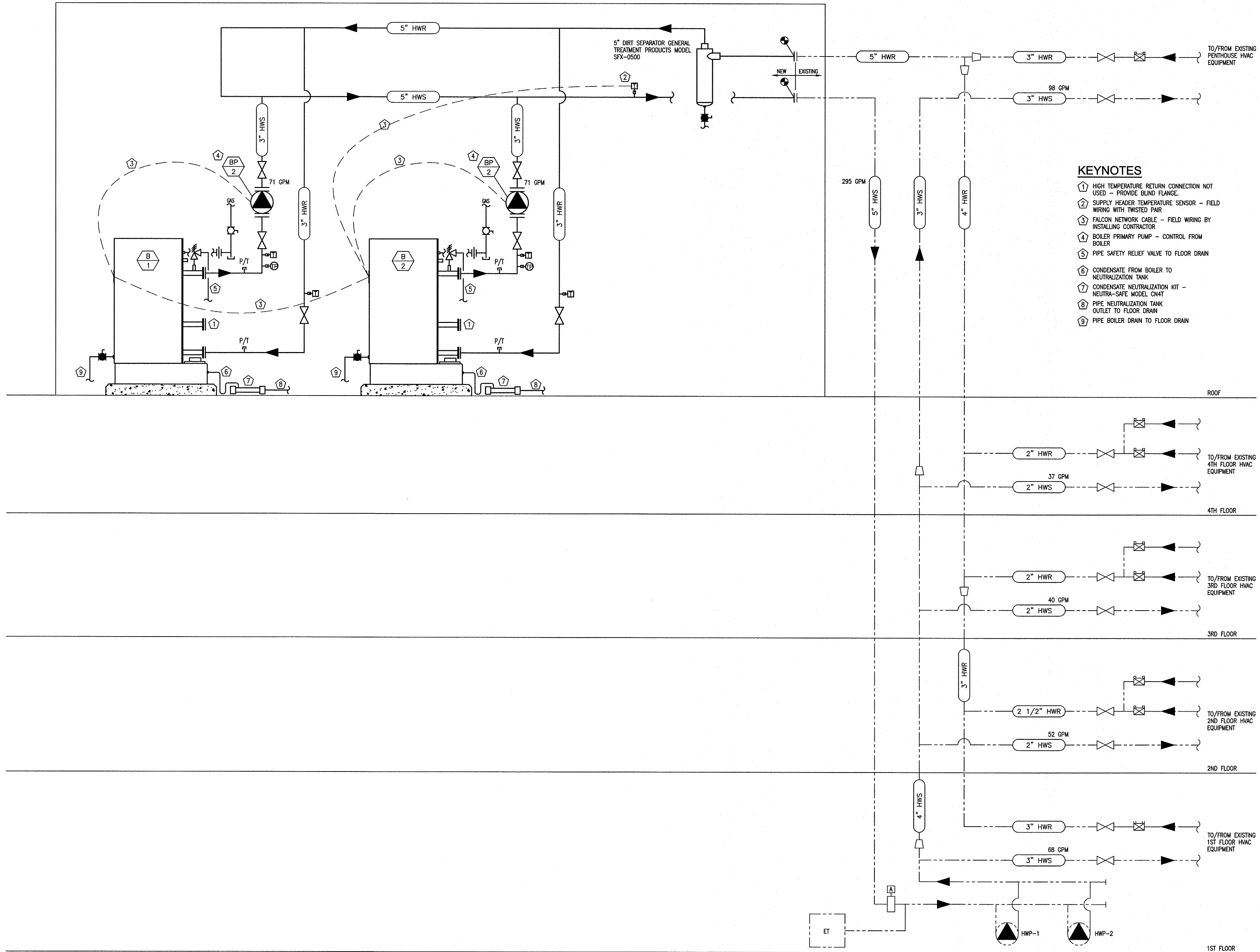
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M1.2



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KEYNOTES

- 1 HIGH TEMPERATURE RETURN CONNECTION NOT USED - PROVIDE BLIND FLANGE.
- 2 SUPPLY HEADER TEMPERATURE SENSOR - FIELD WIRING WITH TWISTED PAIR
- 3 FALCON NETWORK CABLE - FIELD WIRING BY INSTALLING CONTRACTOR
- 4 BOILER PRIMARY PUMP - CONTROL FROM BOILER
- 5 PIPE SAFETY RELIEF VALVE TO FLOOR DRAIN
- 6 CONDENSATE FROM BOILER TO NEUTRALIZATION TANK
- 7 CONDENSATE NEUTRALIZATION KIT - NEUTRA-SAFE MODEL CN4T
- 8 PIPE NEUTRALIZATION TANK OUTLET TO FLOOR DRAIN
- 9 PIPE BOILER DRAIN TO FLOOR DRAIN

KEY PLAN:

PROJECT TITLE / ADDRESS:

STATE OF MAINE

MDOT MAINTENANCE BUILDING
BOILER REPLACEMENT

24 CHILD STREET
AUGUSTA, ME

ISSUE:

BID & PERMIT SET

PROJ. NO.:

S1281

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SCALE:

AS NOTED

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JDP

DRAWN BY:

JDP/DCS

CHKD BY:

SMC

ISSUE DATE:

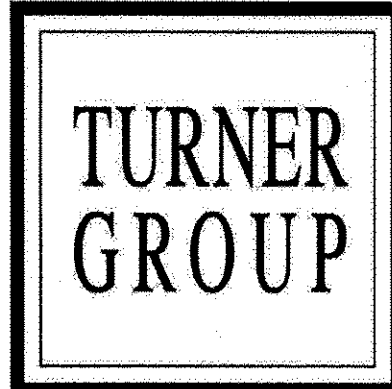
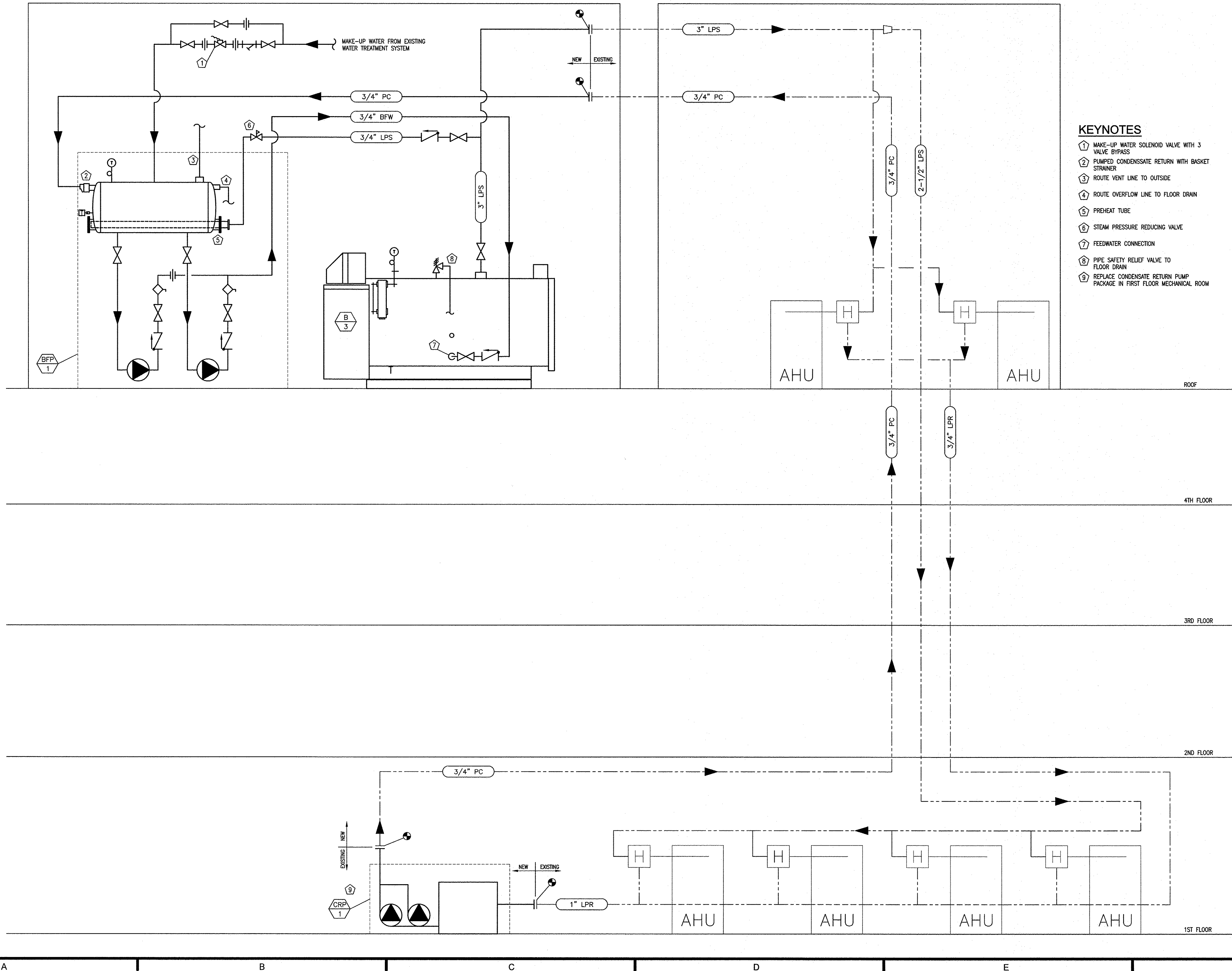
4/18/16

REVISIONS

SHEET TITLE:

DETAILS
SHEET 1 OF 3

M2.1



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KEY PLAN:

PROJECT TITLE / ADDRESS:
STATE OF MAINE

**MDOT MAINTENANCE BUILDING
BOILER REPLACEMENT**

24 CHILD STREET
AUGUSTA, ME

ISSUE:

BID & PERMIT SET

PROJ. NO.:	S1281	STAMP
SCALE:	AS NOTED	
DESN. BY:	JDP	
DRAWN BY:	JDP/DCG	
CHKD BY:	SMC	
ISSUE DATE:	4/18/18	

REVISIONS		

SHEET TITLE:
**DETAILS
SHEET 2 OF 3**

M2.2



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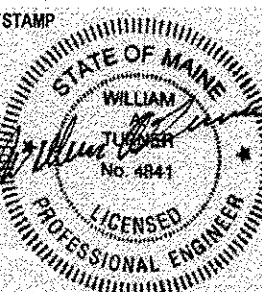
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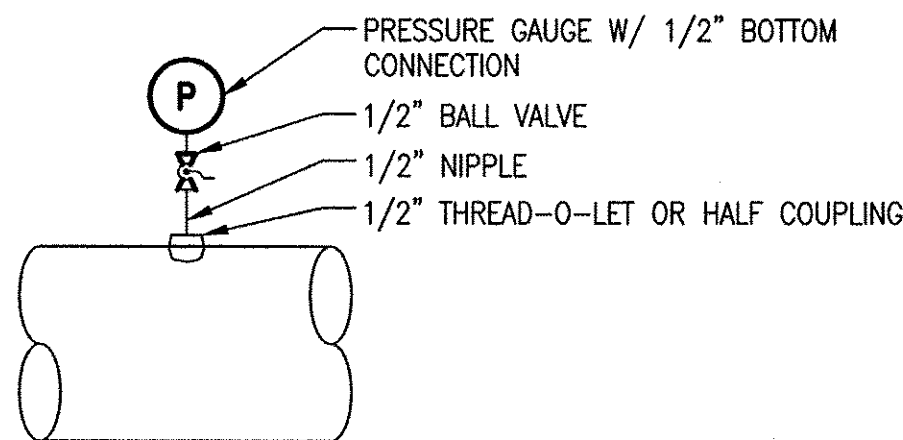


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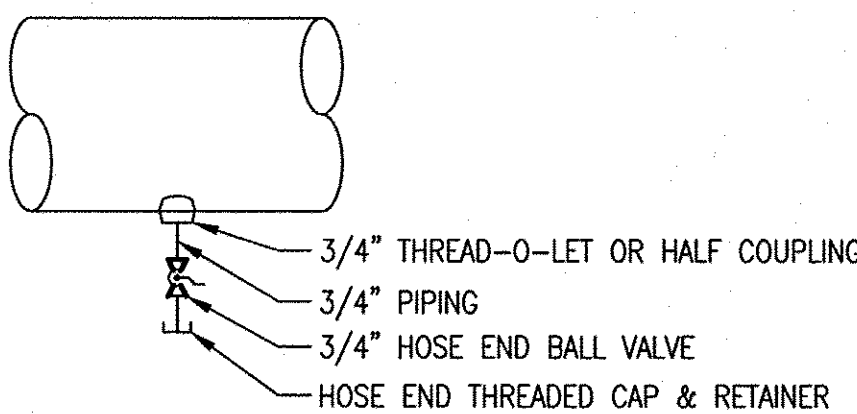
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DETAILS
SHEET 3 OF 3

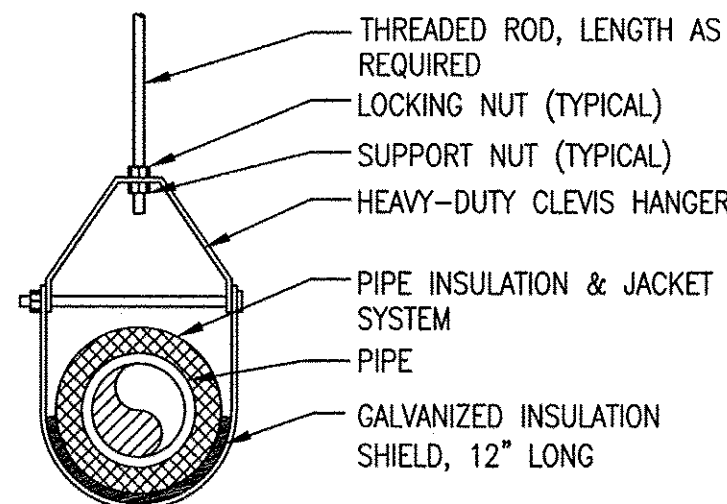
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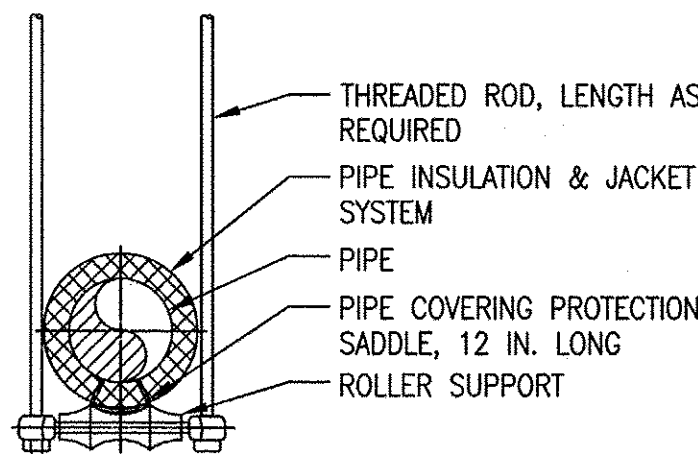
PRESSURE TAPS



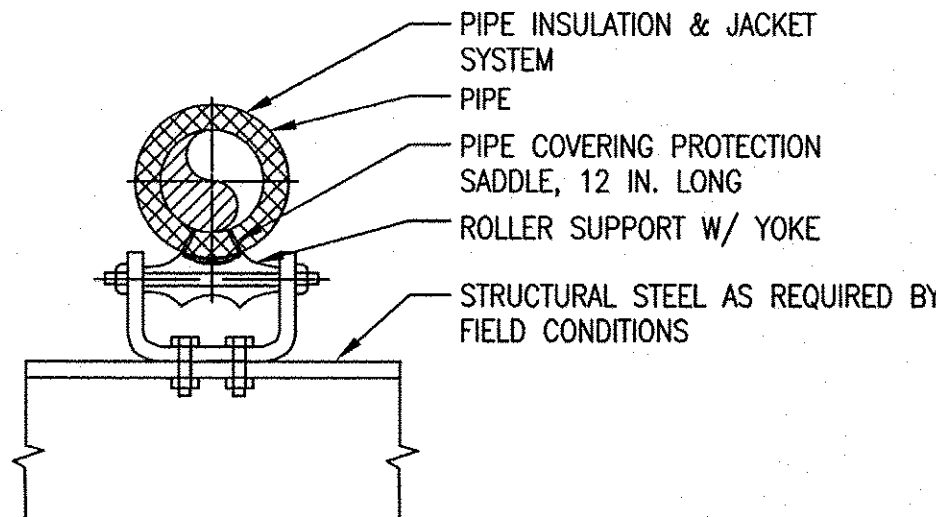
LOW POINT DRAINS



CLEVIS HANGER 3" AND SMALLER

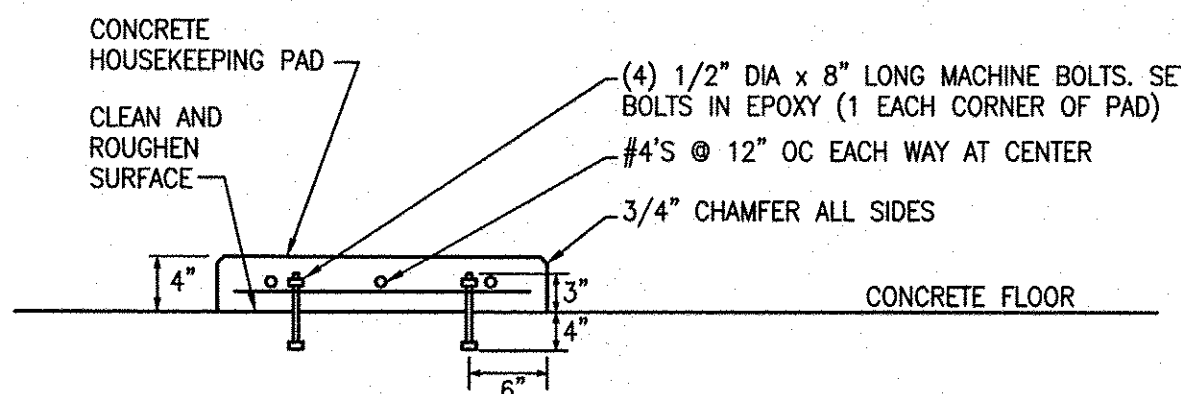


ROLLER HANGER 4" AND LARGER



ROLLER SUPPORT 4" AND LARGER

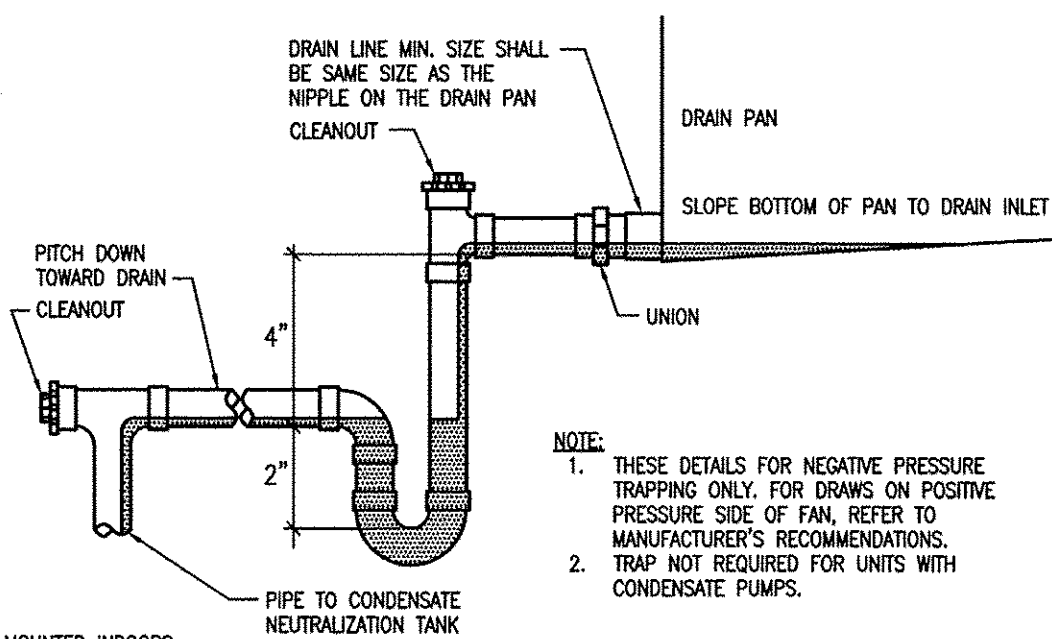
5 TYPICAL PIPE SUPPORT DETAILS
NOT TO SCALE



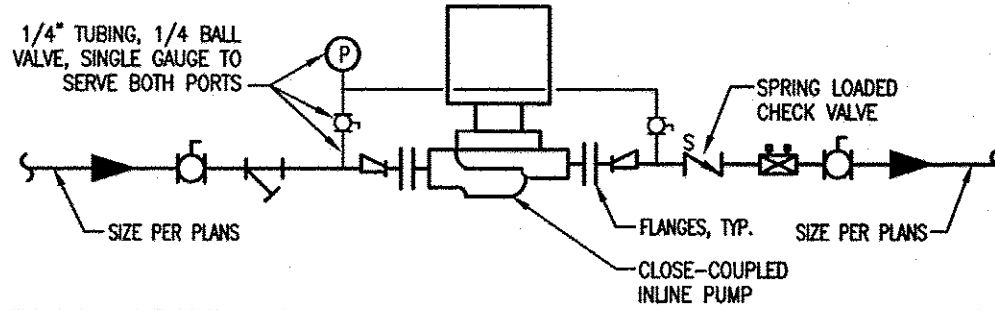
NOTES:

- HOUSEKEEPING PADS SHALL BE NORMAL WEIGHT PORTLAND CEMENT CONCRETE HAVING A MINIMUM COMPRESSIBLE STRENGTH OF 3000 PSI AT 28 DAYS MEETING ASTM C150 TYPE I OR II. MAXIMUM COURSE AGGREGATE SIZE SHALL BE 3/4". THE WATER-CEMENT RATIO SHALL NOT BE GREATER THAN 0.5; SLUMP SHALL NOT EXCEED 4 INCHES.
- ANCHOR BOLTS SHALL MEET ASTM DESIGNATION A307.
- REINFORCING SHALL BE ASTM A615 GRADE 60.

4 DETAIL - CONCRETE HOUSEKEEPING PAD
NOT TO SCALE

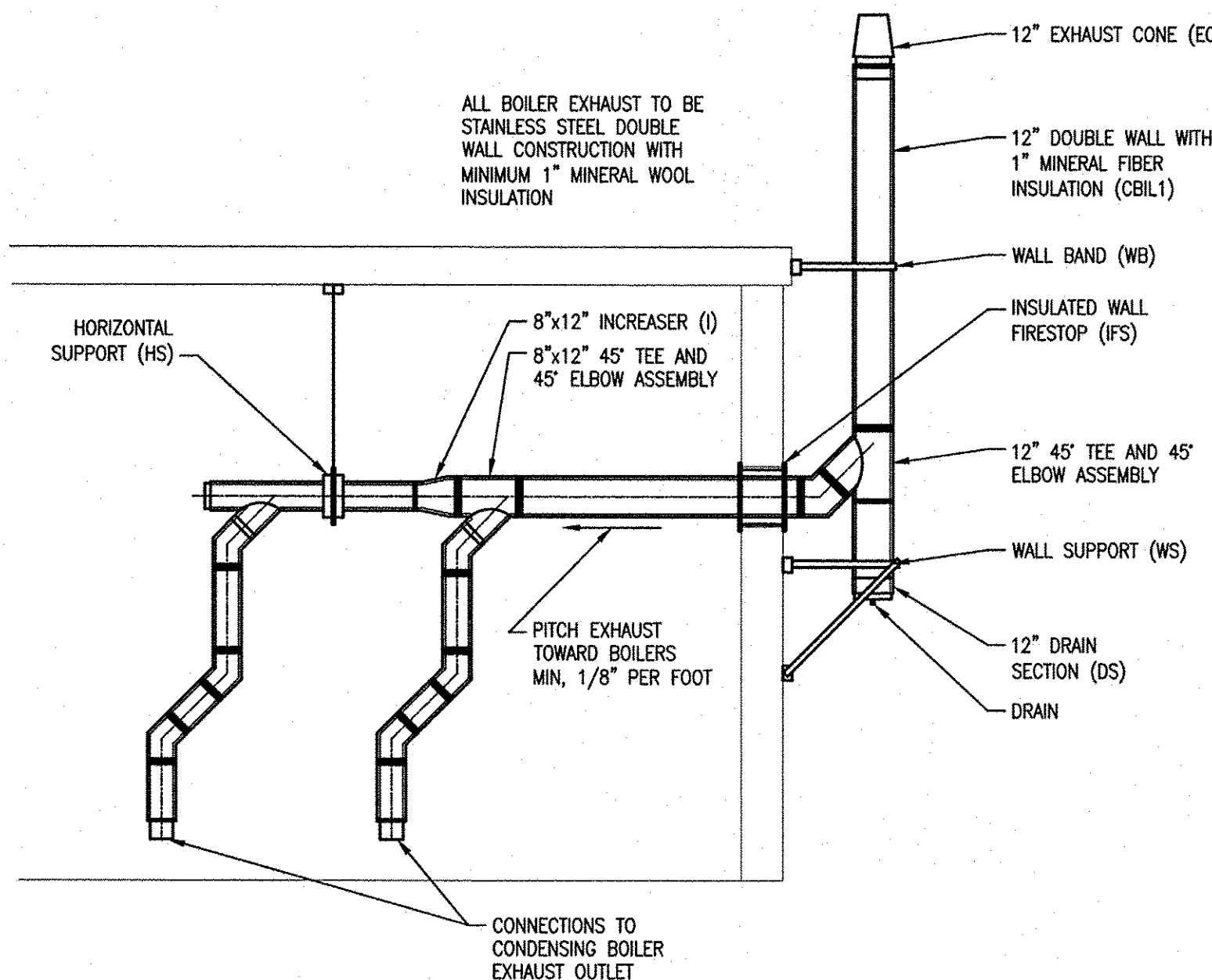


3 DETAIL - CONDENSATE DRAIN TRAPS
NOT TO SCALE



- NOTES:
- REDUCERS SHALL BE ECCENTRIC TYPE
 - VALVES SHALL BE SAME SIZE AS PIPE
 - GAUGES SHALL BE 0-50 PSIG

2 IN-LINE PUMP PIPING SCHEMATIC
NOT TO SCALE



1 CONDENSING BOILER EXHAUST
NOT TO SCALE

HOT WATER CONDENSING BOILER SCHEDULE																											
DESIGNATION	LOCATION	SERVICE	GAS INPUT (NAT. GAS) (MBH)	OUTPUT @ 120/60 (MBH)	OUTPUT @ 180/60 (MBH)	MAWP (PSI)	MAWT (DEG. F)	SEXT. OP. MAXPOINT (DEG. F)	WATER VOLUME (GAL)	ELECTRIC					DIMENSIONS (IN)			SHIPPING WEIGHT (LBS)	OPERATING WEIGHT (LBS)	CONNECTION SIZES (IN)				MANUFACTURER	LINE	MODEL	NOTES
										VOLT	PHASE	HERTZ	AMPS	MOPD	HEIGHT	WIDTH	DEPTH			HEATING SUPPLY	HEATING RETURN	FLUE GAS	COMBUSTION AIR				
B-1	BOILER RM	HEATING WATER	1500	1410	1320	125	210	194	110	115	1	60	15.5	20	79.9	35.9	56	1986	2778	4	4	8	8	CLEAVER BROOKS	CLEARFIRE	CFC-E 1500	
B-2	BOILER RM	HEATING WATER	1500	1410	1320	125	210	194	110	115	1	60	15.5	20	79.9	35.9	56	1986	2778	4	4	8	8	CLEAVER BROOKS	CLEARFIRE	CFC-E 1500	
NOTES:																											

HUMIDIFICATION STEAM BOILER SCHEDULE																								
DESIGNATION	LOCATION	SERVICE	RATING (HP)	STEAM PRESSURE (PSIG)	ASME RATED CAPACITY (LBS/HR)	RATED CAPACITY @ 6 PSI (LBS/HR)	ELECTRIC					DIMENSIONS (IN)			SHIPPING WEIGHT (LBS)	OPERATING WEIGHT (LBS)	CONNECTION SIZES (IN)				MANUFACTURER	LINE	MODEL	NOTES
							VOLT	PHASE	HERTZ	AMPS	MOPD	LENGTH	WIDTH	HEIGHT			STEAM OUTLET	FEEDWATER	BLOWDOWN	STACK				
B-3	BOILER RM	STEAM FOR HUMIDIFICATION	15	15	518	507	115	1	60		20	86	43.5	54	2450	3460	4	1	1	6	CLEAVER BROOKS	CLEARFIRE	H 15	
NOTES:																								
1. XXX																								
2. XXX																								

HVAC PUMP SCHEDULE																			
TAG	LOCATION	SERVICE	TYPE (END SUCTION, HORIZONTAL SPLIT CASE, IN-LINE, ETC.)	DESIGN PUMP DATA			CASING SIZE		MOTOR			ELECTRIC				SHIPPING WEIGHT (LBS)	MANUFACTURER	MODEL	NOTES
				CAPACITY (GPM)	HEAD (FT)	EFFICIENCY (%)	SUCTION (IN)	DISCHARGE (IN)	HP	RPM	VSD (Y/N)	VOLTS	PHASE	HERTZ	AMPS				
BP-1	BOILER ROOM	HEATING WATER	IN-LINE	70	13	-	3	3	1/3	1725	Y	115	1	60	-	95	TACO	IL-131	
BP-2	BOILER ROOM	HEATING WATER	IN-LINE	70	13	-	3	3	1/3	1725	Y	115	1	60	-	95	TACO	IL-131	
NOTES:																			
1. XXXX																			

CONDENSATE RETURN PUMP / BOILER FEEDWATER PUMP																				
TAG	LOCATION	SERVES	DESIGN PUMP DATA			CONDENSATE (LB/HR)	MOTOR (DUPLEX)			ELECTRIC				PUMP DISCHARGE SIZE (IN.)	RECEIVER		OPERATING WEIGHT (LBS)	MANUFACTURER	MODEL	NOTES
			CAPACITY (GPM)	HEAD (FT)	EFFICIENCY (%)		HP	RPM	VSD (Y/N)	AMPS	VOLTS	PHASE	HERTZ		VOLUME (GAL.)	INLET SIZE (IN.)				
CRP-1	BASEMENT	STEAM HUMIDIFICATION SYSTEM	15	40	-		(2) 1	3500	N		230	1	60	3/4	15			SHIPCO	120 ECD-P-30	
FWP-1	BOILER RM	BOILER FEEDWATER	(2) 2	20	-		(2) 1/3	3500	N					3/4	49			SHIPCO	110 - D	1
NOTES:																				
1. INCLUDES DIRECT INJECTION STEAM HEATING ASSEMBLY: STERICO 1520G SIZE 1"																				



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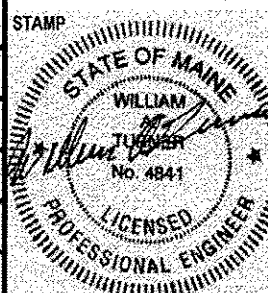
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SHEET TITLE

SCHEDULES

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A

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F

SECTION 230519
METERS AND GAUGES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. PRESSURE GAUGES
- B. STATIC PRESSURE GAUGES
- C. FILTER GAUGES
- D. THERMOMETERS AND THERMOMETER WELLS
- E. THERMOWELL HEAT TRANSFER PASTE
- F. TEST PLUGS

1.2 SUBMITTALS

- A. SUBMIT IN ACCORDANCE WITH SECTION 230500.
- 1.3 ENVIRONMENTAL REQUIREMENTS
 - A. DO NOT INSTALL INSTRUMENTS WHEN AREAS ARE UNDER CONSTRUCTION, EXCEPT FOR REQUIRED ROUGH-IN, TAPS, SUPPORTS, AND TEST PLUGS.

PART 2 PRODUCTS

2.1 PRESSURE GAUGES

- A. MANUFACTURERS: WEISS, AMTEK, DWYER, MARSHALLTOWN, OR TRERICE. NO SUBSTITUTIONS.
- B. GAUGES, HOT WATER HEATING AND GLYCOL HEATING SYSTEMS: WEISS SERIES 4PG-1 INDUSTRIAL PRESSURE GAUGE, DRY NON-FILLED TYPE, WITH PHOSPHOR BRONZE BOURDON TUBE, SILVER BRAZED CONNECTING JOINTS, BRASS SOCKET, BUSHED STAINLESS ROTARY MOVEMENT, 1/4-INCH NPT CONNECTION, WHITE ALUMINUM DIAL WITH BLACK MARKINGS, BLACK ALUMINUM POINTER WITH FRONT SLOTTED ADJUSTMENT.
 - 1. CASE: CAST ALUMINUM OR STAINLESS STEEL.
 - 2. LENS: PUSH-IN LEXAN POLYCARBONATE, OR CLEAR GLASS OR ACRYLIC WITH STAINLESS STEEL RING, PER MANUFACTURER'S STANDARD.
 - 3. BOURDON TUBE: PHOSPHOR BRONZE.
 - 4. DIAL SIZE: 4 TO 4-1/2 INCH (101 TO 114 MM).
 - 5. CONNECTION: LOWER OR LOWER BACK, 1/4 INCH OR 1/2 INCH NPT, AS SELECTED BY CONTRACTOR.
 - 6. ACCURACY: 1 PERCENT OF FULL SCALE RANGE, PER ANSI-ASME B40.1 GRADE 1A.
 - 7. SCALE: PSI.
 - 8. RANGE: 0-60 PSIG TYPICAL, SELECT FOR APPLICATION.
- C. STATIC PRESSURE GAUGES:
 - 1. 3-1/2 INCH (89 MM) DIAMETER DIAL IN METAL CASE, DIAPHRAGM ACTUATED, BLACK FIGURES ON WHITE BACKGROUND, FRONT RECALIBRATION ADJUSTMENT, 2 PERCENT OF FULL SCALE ACCURACY.
 - 2. ACCESSORIES: STATIC PRESSURE TIPS WITH COMPRESSION FITTINGS FOR BULKHEAD MOUNTING, 1/4 INCH (6 MM) DIAMETER TUBING.
- C. VERIFY SUITABILITY OF RANGE FOR EACH APPLICATION. BEST SELECTION IS FOR TYPICAL READING TO BE CLOSE TO MID-SCALE.

2.2 THERMOMETERS - DIAL TYPE

- A. MANUFACTURERS: WEISS, AMTEK, ERNST, OR TRERICE. NO SUBSTITUTIONS.
- B. THERMOMETER: WEISS MODEL 45VA, ASTM E1, STAINLESS STEEL OR CAST ALUMINUM CASE, ADJUSTABLE ANGLE WITH FRONT RECALIBRATION, VAPOR ACTUATED, BLACK SCALE ON WHITE-FINISHED METAL BACKGROUND, BLACK POINTER, SEALED LENS, BRASS STEM. WEISS WARY-ANGLE DIGITAL LIGHT-POWERED THERMOMETERS MAY BE SUBSTITUTED IN WELL-LIT LOCATIONS IN BOILER ROOM ONLY.
 - 1. SIZE: 4 TO 4-1/2 INCH (101 TO 114 MM) DIAL.
 - 2. LENS: SNAP-IN LEXAN POLYCARBONATE WITH O-RING, OR CLEAR GLASS WITH RUBBER RING.
 - 3. BULB: COPPER. PROVIDE EXTENDED BULB FOR SOCKET EXTENSION IN INSULATED PIPE.
 - 4. EXTENDED BULB: WHERE REQUIRED, PROVIDE EXTENDED CAPILLARY TUBE WITH BRAIDED COPPER PROTECTION.
 - 5. CONNECTION: SEPARABLE SOCKET.
 - 6. ACCURACY: 1 SCALE DIVISION THROUGHOUT RANGE.
 - 7. CALIBRATION: BOTH DEGREES F AND DEGREES C.
 - 8. SCALE RANGE: 0 TO100 DEGREES F (-20 TO 40 DEGREES C) FOR OUTSIDE AIR SYSTEMS; 30 TO 240 DEGREES F (0 TO 115 DEGREES C) FOR SUPPLY AIR SYSTEMS.
 - 9. GRADUATIONS: 2 DEGREES F.
 - 10. AIR DUCT FLANGE: PROVIDE FOR DUCT APPLICATIONS.
- C. SOCKET (THERMOMETER WELL) FOR PIPING: BRASS SEPARABLE SOCKETS FOR THERMOMETER STEMS, WITH EXTENSIONS FOR INSULATED PIPING. FILL WITH PASTE.
- D. FLANGE FOR DUCT: 3 INCH (76 MM) OUTSIDE DIAMETER REVERSIBLE FLANGE, DESIGNED TO FASTEN TO SHEET METAL AIR DUCTS, WITH BRASS PERFORATED STEM.

2.3 THERMOWELL HEAT TRANSFER PASTE

- A. MANUFACTURERS: HONEYWELL, MG CHEMICALS, OR TRERICE. NO SUBSTITUTIONS.
- B. DESCRIPTION: FORMULATION OF SILICONE OR SYNTHETIC BASE, CONTAINING METAL OXIDES; THERMAL CONDUCTIVITY AT LEAST 4.5 BTU-IN/(HR-Ft2-F); TEMPERATURE RANGE TO 392 DEGREES F; FLASH POINT 500 DEGREES F; DROPPING POINT PER ASTM D566, GREATER THAN 500 DEGREES F; SPECIFIC GRAVITY 2.3 MINIMUM AT 77 DEG. F; CONSISTENCY PER ASTM D217, 310 TO 320.
- 2.4 TEST PLUGS
 - A. MANUFACTURERS: PETERSON EQUIPMENT CO. "PETE'S PLUGS," FLOW DESIGN INC., TRERICE, OR WEISS. NO SUBSTITUTIONS.
 - B. DESCRIPTION: 1/2-INCH NPT BRASS FITTING AND CAP FOR RECEIVING 1/8-INCH OUTSIDE DIAMETER PRESSURE OR TEMPERATURE PROBE WITH SELF-CLOSING VALVE. VALVE CORE OF NORDEL (EPDM) SUITABLE FOR WATER AND GLYCOL HYDRONIC HEATING AND COOLING SERVICE IN TEMPERATURE RANGE 30 TO 275 DEGREES F. WORKING PRESSURE 500 PSIG. CAP RETAINING STRAP COLOR-CODED TO INDICATE CORE MATERIAL. EITHER DUAL SELF-CLOSING VALVES (PETE'S PLUG STANDARD DESIGN) OR SINGLE VALVE ARE ALLOWED.

PART 3 EXECUTION

3.1 INSTALLATION

- A. INSTALL ONE PRESSURE GAUGE PER PUMP, WITH TAPS ON SUCTION AND DISCHARGE OF PUMP; PIPE TO GAUGE.
- B. INSTALL GAUGE TAPS IN PIPING; REFER TO DIVISION 23 SECTION "HYDRONIC PIPING."
- C. INSTALL PRESSURE GAUGES WITH PULSATION DAMPERS. PROVIDE VALVE TO ISOLATE EACH GAUGE; EXTEND NIPPLES TO ALLOW CLEARANCE FROM INSULATION.
- D. INSTALL THERMOMETERS IN PIPING SYSTEMS IN SOCKETS IN SHORT COUPLINGS. ENLARGE PIPES SMALLER THAN 2-1/2 INCHES (64 MM) FOR INSTALLATION OF THERMOMETER SOCKETS. ENSURE SOCKETS ALLOW CLEARANCE FROM INSULATION.
- E. INSTALL THERMOMETERS IN AIR DUCT SYSTEMS ON FLANGES.
- F. FILL THERMOMETER SOCKETS WITH HEAT TRANSFER PASTE.

- G. INSTALL THERMOMETER SOCKETS ADJACENT TO CONTROLS SYSTEMS THERMOSTAT, TRANSMITTER, OR SENSOR SOCKETS.
- H. LOCATE DUCT MOUNTED THERMOMETERS MINIMUM 10 FEET (3 M) DOWNSTREAM OF MIXING DAMPERS, COILS, OR OTHER DEVICES CAUSING AIR TURBULENCE.
- I. COIL AND CONCEAL EXCESS CAPILLARY ON REMOTE ELEMENT INSTRUMENTS.
- J. INSTALL STATIC PRESSURE GAUGES TO MEASURE ACROSS FILTERS AND FILTER BANKS (INLET TO OUTLET). ON MULTIPLE BANKS, PROVIDE MANIFOLD AND SINGLE GAUGE.
- K. PROVIDE INSTRUMENTS WITH SCALE RANGES SELECTED ACCORDING TO SERVICE WITH LARGEST APPROPRIATE SCALE.
- L. INSTALL GAUGES AND THERMOMETERS IN LOCATIONS WHERE THEY ARE EASILY READ FROM NORMAL OPERATING LEVEL. INSTALL VERTICAL TO 45 DEGREES OFF VERTICAL.
- M. ADJUST GAUGES AND THERMOMETERS TO FINAL ANGLE, CLEAN WINDOWS AND LENSES, AND CALIBRATE TO ZERO.
- N. LOCATE TEST PLUGS WHERE INDICATED.
- O. PROVIDE PRESSURE GAUGE AT HIGH POINT OF HYDRONIC AND GLYCOL SYSTEMS FOR SETTING OF COLD WATER MAKE-UP PRESSURE REDUCING VALVE.

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR MECHANICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. TESTING, ADJUSTMENT, AND BALANCING OF HYDRONIC PIPING SYSTEMS.
- 1.2 DEFINITIONS
 - A. ASHRAE: AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS.
 - B. NEBB: NATIONAL ENVIRONMENTAL BALANCING BUREAU.
 - C. TAB: TESTING, ADJUSTING, AND BALANCING.

1.3 SUBMITTALS

- A. SUBMIT IN ACCORDANCE WITH SECTION 230500.
- B. SUBMIT NAME OF TAB AGENCY FOR APPROVAL WITHIN 14 DAYS AFTER AWARD OF CONTRACT.
- C. DESIGN REVIEW REPORTS:
 - 1. SUBMIT PRIOR TO COMMENCEMENT OF CONSTRUCTION UNDER PROVISIONS OF DIVISION 01 SECTION "QUALITY REQUIREMENTS."
 - 2. REVIEW THE CONTRACT DOCUMENTS, AND INDICATE DEFICIENCIES IN SYSTEMS THAT WOULD PREVENT PROPER TESTING, ADJUSTING, AND BALANCING OF SYSTEMS AND EQUIPMENT TO ACHIEVE SPECIFIED PERFORMANCE.
- D. PRELIMINARY REPORT SUBMITTALS:
 - 1. PRIOR TO COMMENCING WORK OF THIS SECTION, AND NO MORE THAN 14 DAYS AFTER APPROVAL OF TAB AGENCY SUBMITTALS, SUBMIT REPORT FORMS OR OUTLINES INDICATING ADJUSTING, BALANCING, AND EQUIPMENT DATA REQUIRED, WITH COLUMNS OF DESIGN DATA FILLED IN. BY MEANS OF PLAN VIEWS, EQUIPMENT PROFILES, AND SIMILAR GRAPHICAL DESCRIPTIONS, INDICATE WHERE MEASUREMENTS WILL BE TAKEN.
 - 2. SUBMIT THE PROCEDURES TO BE USED.
- D. FIELD REPORTS: SUBMIT DRAFT COPIES OF REPORT FOR REVIEW PRIOR TO FINAL ACCEPTANCE OF PROJECT. PROVIDE FINAL COPIES FOR ARCHITECT/ENGINEER AND FOR INCLUSION IN OPERATING AND MAINTENANCE MANUALS.
- E. PROVIDE REPORTS IN LETTER SIZE, 3-RING BINDER MANUALS, COMPLETE WITH INDEX PAGE AND INDEXING TABS, WITH COVER IDENTIFICATION AT FRONT AND SIDE. INCLUDE SET OF REDUCED DRAWINGS WITH AIR OUTLETS AND EQUIPMENT IDENTIFIED TO CORRESPOND WITH DATA SHEETS, AND INDICATING THERMOSTAT LOCATIONS.
- F. INCLUDE DETAILED PROCEDURES, AGENDA, SAMPLE REPORT FORMS AND COPY OF AABC NATIONAL PROJECT PERFORMANCE GUARANTY PRIOR TO COMMENCING SYSTEM BALANCE.
- G. TEST REPORTS: INDICATE DATA ON AABC NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE FORMS, OR FORMS PREPARED FOLLOWING ASHRAE 111, OR NEBB FORMS, OR FORMS CONTAINING INFORMATION INDICATED IN SCHEDULES.

1.4 QUALITY ASSURANCE

- A. PERFORM TOTAL SYSTEM BALANCE IN ACCORDANCE WITH AABC NATIONAL STANDARDS FOR FIELD MEASUREMENT AND INSTRUMENTATION, TOTAL SYSTEM BALANCE, OR ASHRAE 111; OR NEBB PROCEDURAL STANDARDS FOR TESTING, BALANCING AND ADJUSTING OF ENVIRONMENTAL SYSTEMS.

1.5 QUALIFICATIONS

- A. AGENCY: COMPANY SPECIALIZING IN THE TESTING, ADJUSTING, AND BALANCING OF SYSTEMS SPECIFIED IN THIS SECTION WITH MINIMUM 3 YEARS' EXPERIENCE AND CERTIFIED BY AABC OR NEBB, OR EQUIVALENT EXPERIENCE WHICH WOULD QUALIFY FOR MEMBERSHIP IN THESE TESTING ORGANIZATIONS. AGENCY SHALL BE ONE OF THOSE LISTED UNDER PARAGRAPH 3.01 AGENCIES IN THIS SECTION.
- B. PERFORM WORK UNDER SUPERVISION OF AABC CERTIFIED TEST AND BALANCE ENGINEER, NEBB CERTIFIED TESTING, BALANCING AND ADJUSTING SUPERVISOR, OR REGISTERED PROFESSIONAL ENGINEER EXPERIENCED IN PERFORMANCE OF THIS WORK AND LICENSED AT THE PLACE WHERE THE PROJECT IS LOCATED.
- C. CERTIFICATION BY THE NATIONAL BALANCING COUNCIL (NBC) (AN AFFILIATE OF THE NATIONAL COMFORT INSTITUTE (NCI)) WILL NOT BE ALLOWED AS A SUBSTITUTE FOR THE SPECIFIED QUALIFICATIONS.
- D. THE APPROVED AGENCY SHALL BE IN NO WAY AFFILIATED WITH THE INSTALLING SUBCONTRACTOR.
- E. AGENCIES
 - 1. TEKON TECHNICAL CONSULTANTS, ROCHESTER, NH. CONTACT: CHARLES CORLIN, (603) 335-3080.
 - 2. HOOD T.A.B. LLC, ANDOVER, MA. CONTACT: MICHAEL HOOD, (978) 474-7595.
 - 3. NETB ASSOCIATES LLC, EAST KINGSTON, NH. CONTACT: FRANK COLLAMORE, (978) 270-7547.
 - 4. AIR SOLUTIONS & BALANCING, AUBURN, NH. CONTACT: OLAF ZWICKAU, (603) 262-9292.
 - 5. NO SUBSTITUTIONS.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 EXAMINATION

- A. VERIFY THAT SYSTEMS ARE COMPLETE AND OPERATING CORRECTLY IN ACCORDANCE WITH SEQUENCE OF OPERATIONS BEFORE COMMENCING WORK.
- B. SUBMIT FIELD REPORTS. REPORT TO THE RESPONSIBLE SUBCONTRACTORS, DEFECTS AND DEFICIENCIES NOTED DURING PERFORMANCE OF SERVICES WHICH PREVENT SYSTEM BALANCE. SUBMIT LIST OF LOCATIONS WHERE THE CONTRACTOR NEEDS TO PROVIDE ADDITIONAL BALANCING DEVICES.
- C. BEGINNING OF WORK MEANS ACCEPTANCE OF EXISTING CONDITIONS.

3.2 INSTALLATION TOLERANCES

- A. HYDRONIC SYSTEMS: ADJUST TO WITHIN PLUS OR MINUS 10 PERCENT OF DESIGN.

3.3 ADJUSTING

- A. ENSURE RECORDED DATA REPRESENTS ACTUAL MEASURED OR OBSERVED CONDITIONS.
- B. PERMANENTLY MARK SETTINGS OF VALVES, DAMPERS, AND OTHER ADJUSTMENT DEVICES ALLOWING SETTINGS TO BE RESTORED. SET AND LOCK MEMORY STOPS.
- C. AFTER ADJUSTMENT, TAKE MEASUREMENTS TO VERIFY BALANCE HAS NOT BEEN DISRUPTED OR THAT SUCH DISRUPTION HAS BEEN RECTIFIED.
- D. LEAVE SYSTEMS IN PROPER WORKING ORDER, AT SPECIFIED SETTINGS.

3.4 WATER SYSTEM PROCEDURE

- A. ADJUST WATER SYSTEMS TO PROVIDE REQUIRED OR DESIGN QUANTITIES.
- B. USE CALIBRATED FITTINGS AND PRESSURE GAUGES TO DETERMINE FLOW RATES. EFFECT ADJUSTMENT OF WATER DISTRIBUTION SYSTEMS BY MEANS OF BALANCING COOKS, VALVES, AND FITTINGS. DO NOT USE SHUT-OFF VALVES FOR BALANCING.
- C. ADJUST SYSTEMS TO PROVIDE SPECIFIED PRESSURE DROPS AND FLOWS THROUGH HEAT TRANSFER ELEMENTS PRIOR TO THERMAL TESTING. PERFORM BALANCING BY MEASUREMENT OF TEMPERATURE DIFFERENTIAL IN CONJUNCTION WITH AIR BALANCING.
- D. EFFECT SYSTEM BALANCE WITH AUTOMATIC CONTROL VALVES FULLY OPEN TO HEAT TRANSFER ELEMENTS.
- E. WHERE AVAILABLE PUMP CAPACITY IS LESS THAN TOTAL FLOW REQUIREMENTS OF INDIVIDUAL SYSTEM PARTS (DUE TO SYSTEM DIVERSITY), FULL FLOW IN ONE PART MAY BE SIMULATED BY TEMPORARY RESTRICTION OF FLOW TO OTHER PARTS.
- F. COORDINATE WITH DIVISION 23 SECTION "INSTRUMENTATION AND CONTROLS FOR MECHANICAL SYSTEMS" FOR CALIBRATION OF PUMP STATIC PRESSURE SENSORS AND DETERMINATION OF PRESSURE SETPOINTS.



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KEY PLAN:

PROJECT TITLE / ADDRESS:

STATE OF MAINE

MDOT MAINTENANCE BUILDING
BOILER REPLACEMENT

24 CHILD STREET
AUGUSTA, ME

ISSUE:

BID & PERMIT SET

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SCALE:

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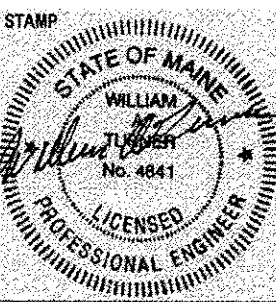
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SMC

ISSUE DATE:

4/8/18



REVISIONS

SHEET TITLE:

SPECIFICATIONS
SHEET 2 OF 4

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SECTION 235216
STEAM BOILER

- 1.0 GENERAL BOILER DESIGN
- A. THE BOILER SHALL BE A CLEAVER-BROOKS MODEL CFH 700, SINGLE PASS HORIZONTAL COMMERCIAL FIRETUBE DESIGN OR APPROVED EQUAL. IT SHALL BE MOUNTED ON A HEAVY-DUTY STEEL FRAME WITH PREMIX FORCED DRAFT BURNER AND BURNER CONTROLS AS A COMPLETE PACKAGE FROM ONE MANUFACTURER.
- B. APPROVALS - THE COMPLETE PACKAGE INCLUDING THE BURNER SHALL BE UNDERWRITERS LABORATORIES, INC. LISTED AND THE OFFICIAL UL/CUL LABEL SHALL BE AFFIXED TO THE PACKAGE ATTESTING TO ITS CERTIFICATION.
- C. AS A PREASSEMBLED PACKAGE, THE STANDARD BOILER SHALL BE FACTORY FIRE TESTED.
- D. THE COMPLETE PACKAGE AS SHIPPED, SHALL BE READY FOR CONNECTIONS TO WATER, FUEL, BLOWDOWN, AND EXHAUST VENTING. CERTAIN ITEMS MAY BE SHIPPED LOOSE TO PREVENT THEIR DAMAGE SUCH AS THE SAFETY VALVES AND GAUGES.
- E. THE SPECIFIED BOILER SHALL HAVE AN OUTPUT RATING OF _____HORSEPOWER WHEN FIRED WITH NATURAL GAS (LP GAS) WITH A GAS SUPPLY PRESSURE OF _____.
- F. PERFORMANCE: SHALL BE AS SPECIFIED IN PARAGRAPH 5 BELOW.
- 1.1 BOILER SHELL
- A. THE BOILER SHELL MUST BE CONSTRUCTED IN ACCORDANCE WITH THE ASME CODE, EITHER SECTION I FOR HIGH-PRESSURE STEAM OR SECTION IV FOR LOW-PRESSURE STEAM. THE VESSEL MUST BE SUBJECTED TO THE REQUIRED INSPECTIONS OF THE CODE CONDUCTED BY AN INDEPENDENT THIRD PARTY INSPECTOR. A SIGNED INSPECTION SHEET SHALL BE PROVIDED TO THE PURCHASER AND THE APPROPRIATE ASME SYMBOL SHALL BE AFFIXED OR STAMPED ONTO THE BOILER.
1. BOILER SHALL BE MOUNTED ON BASE RAILS SUITABLE FOR TRANSPORTING BY FORK LIFT.
2. BURNER HOUSING SHALL BE HINGE-MOUNTED TO ALLOW TUBE INSPECTION.
3. EACH CARBON STEEL BOILER TUBE SHALL UTILIZE THE ALUFER HEAT TRANSFER DESIGN TECHNOLOGY FOR HIGH EFFICIENCY AND REDUCTION IN OVERALL SIZE OF THE VESSEL AND SHALL BE A MINIMUM OF 0.105 TUBE WALL THICKNESS.
4. TO FACILITATE WATERSIDE INSPECTION, 3 HAND HOLES SHALL BE PROVIDED.
5. AN OBSERVATION PORT FOR FLAME INSPECTION SHALL BE PROVIDED.
6. BOILER INSULATION SHALL CONSIST OF 2-INCH FIBERGLASS BLANKET, WHICH SHALL BE COVERED WITH A POWDER COATED SHEET METAL JACKET. THIS JACKET AND INSULATION DESIGN SHALL PERMIT FIELD REMOVAL AND REATTACHMENT IF NECESSARY FOR INSPECTION, ETC.
7. THE ENTIRE BOILER AND BASE FRAME SHALL BE FACTORY PAINTED.
8. EXHAUST VENT SHALL BE LOCATED AT THE REAR OF THE BOILER AND SHALL BE A SLIP CONNECTION. STACK SUPPORT SHALL BE BY MEANS OTHER THAN THE BOILER CONNECTION.
- 1.2 BOILER SHELL TAPPINGS/OPENINGS
- A. THE FOLLOWING BOILER VESSEL TAPPINGS/OPENINGS SHALL BE FURNISHED:
1. STEAM SUPPLY BY NPT CONNECTION FOR HIGH-PRESSURE STEAM OR FLANGED FOR LOW PRESSURE STEAM.
2. BOTTOM BLOWDOWN.
3. FEEDWATER MAKE-UP.
4. SURFACE BLOWOFF.
5. CHEMICAL FEED.
6. HIGH WATER LEVEL OVERFLOW DRAIN TO DISCHARGE WATER IN THE BOILER IF WATER LEVEL REACHES AN UNACCEPTABLE LEVEL.
- 2.0 STEAM BOILER TRIM (ALL PIPING AND DEVICES PER ASME CSD-1) A. WATER COLUMN
1. A WATER COLUMN SHALL BE FURNISHED COMPLETE WITH GAUGE GLASS AND WATER COLUMN BLOWDOWN VALVE.
- a. FEEDWATER PUMP CONTROL - SHALL BE INTEGRAL WITH THE WATER COLUMN VIA PROBE CONTROL DEVICE AND ELECTRONICS FOR ON/OFF PUMP OPERATION.
- b. LOW WATER CUTOFF - SHALL BE INTEGRAL WITH THE WATER COLUMN VIA PROBE CONTROL DEVICE AND SOLID STATE ELECTRONICS MOUNTED AND WIRED IN THE CONTROL PANEL.
- B. AN AUXILIARY LOW WATER CUTOFF SHALL BE PROVIDED. IT SHALL BE LOCATED ON THE TOP CENTERLINE OF THE BOILER USING AN INTERNAL PROBE AND SHALL BE OF THE MANUAL RESET DESIGN.
- C. FOR SAFETY STEAM PRESSURE LOCKOUT A HIGH LIMIT PRESSURE CONTROL, MANUAL RESET SHALL BE PROVIDED. THE DEVICE SHALL BE MERCURY FREE.
- D. TO PROVIDE STEAM DEMAND TRACKING A STEAM PRESSURE TRANSMITTER SHALL BE PROVIDED THAT PROVIDES AN INPUT SIGNAL FOR BURNER POSITIONING IN ACCORDANCE TO STEAM DEMAND.
- E. A 3" STEAM PRESSURE GAUGE SHALL BE PIPED ONTO THE TRIM PIPING, INCLUDING AN INSPECTORS TEST COCK.
- F. IN ACCORDANCE WITH THE A.S.M.E. CODE AN APPROVED A.S.M.E. RATED AND STAMPED SAFETY VALVE SHALL BE PROVIDED AND SET AT [15 OR 150]#.
- 3.0 BURNER AND BURNER CONTROLS
- A. MODE OF OPERATION - TO MINIMIZE SHORT CYCLING AND PROVIDE HIGHEST EFFICIENCY THE BURNER FOR THE SPECIFIED BOILER SHALL BE OF THE ELECTRONIC MODULATION WITH A TURNDOWN RATIO OF 5:1 FOR NATURAL GAS FOR SIZES OF _____.
- 40 HORSEPOWER AND GREATER, AND 4:1 FOR SIZES BELOW 40 HORSEPOWER. ON/OFF OR LOW/ HIGH BURNER OPERATION SHALL NOT BE ACCEPTED.
- B. B. THE BURNER SHALL BE ENCLOSED IN A NEMA 1 TYPE ENCLOSURE. A LIFT OFF TOP COVER SHALL BE PROVIDED TO GAIN ACCESS TO THE BURNER AND CONTROLS.
- C. C. DESIGN - THE BURNER DESIGN SHALL BE OF THE LINKAGE-LESS PREMIX TECHNOLOGY WHEREIN THE FUEL AND AIR ARE MIXED IN THE FAN HOUSING ASSEMBLY PRIOR TO ENTERING THE BURNER CANISTER. SEPARATELY DRIVEN LINKAGE OR SERVO MOTOR DRIVEN FUEL AND AIR VALVES SHALL NOT BE PERMITTED.
1. FAN HOUSING SHALL UTILIZE NON-SPARKING MATERIAL AND SHALL BE APPROVED FOR PREMIX OPERATION.
2. THE FAN SHALL BE DRIVEN BY A VARIABLE SPEED MOTOR WHICH SHALL REACT TO OUTPUT DEMAND REQUIREMENTS VIA THE DEMAND CONTROL MOTOR SHALL BE A HIGH EFFICIENCY DC BRUSHLESS TYPE. CONTINUOUS SPEED SYNCHRONOUS MOTORS WILL NOT BE ACCEPTABLE.
- D. IGNITION OF THE FUEL SHALL BE OF THE DIRECT SPARK DESIGN. SEPARATE PILOT GAS TRAIN IS NOT REQUIRED. DUAL IGNITION ELECTRODES SHALL USED FOR THE SPARK GENERATED FROM THE PANEL MOUNTED IGNITION TRANSFORMER.
- E. COMBUSTION SHALL TAKE PLACE ON THE SURFACE OF THE BURNER CANISTER. THE CANISTER SHALL BE CONSTRUCTED OF FERRALLOY MATERIAL AND STAINLESS STEEL AND SHALL BE WARRANTED FOR FIVE YEARS AGAINST FAILURE FROM DEFECTS OR POOR WORKMANSHIP.
- F. AIR FILTER - SHALL BE FITTED TO THE INTAKE AIR VENTURI TO FILTER THE INCOMING AIR SUPPLY WHEN USING BOILER ROOM AIR. THE AIR FILTER SHALL BE DESIGNED TO BE EASILY CLEANED AND RE-USED.
- G. FUEL - THE BURNER SHALL BE DESIGNED FOR OPERATION WITH NATURAL GAS OR LP GAS. GAS TRAIN, SHALL BE LOCATED AT THE FRONT OF THE BURNER AND ALONG THE LEFT SIDE OF THE BOILER. IN ACCORDANCE WITH UL/CUL AND ASME
- CSD-1, THE FOLLOWING COMPONENTS SHALL BE FURNISHED:
1. SINGLE BODY DUAL SOLENOID SAFETY SHUTOFF VALVE INCORPORATING THE FOLLOWING:
- a. THE VALVE SHALL BE A 1:1 RATIO VALVE WITH AN INTEGRAL TRIM REGULATOR AND SHALL OPERATE IN RELATION TO THE FAN SPEED. AN AIR SENSING LINE SHALL BE CONNECTED FROM THE AIR INLET VENTURI (MOUNTED TO THE FAN MOTOR) AND TO THE GAS VALVE FOR CONTROL OF GAS INPUT.
- b. AS FAN SPEED INCREASES A NEGATIVE PRESSURE WILL BE APPLIED TO THE VALVE, ALLOWING THE VALVE TO OPEN FURTHER, PERMITTING MORE FUEL TO FLOW INTO THE VENTURI FOR MIXING. AS FAN SPEED IS REDUCED, FUEL INPUT SHALL BE REDUCED ACCORDINGLY. AIR SHALL ALWAYS LEAD FUEL FROM LOW TO HIGH OR HIGH TO LOW.
2. MANUAL FUEL SHUTOFF VALVE - SHALL BE LOCATED DOWNSTREAM OF THE GAS VALVE AND USED FOR CSD-1 LEAK TESTING.
3. GAS PRESSURE INTERLOCKS - ONE SHALL BE PROVIDED FOR SENSING HIGH GAS PRESSURE AND ONE PROVIDED TO SENSE LOW GAS PRESSURE. EACH CONTROL SHALL BE OF THE MANUAL RESET TYPE.
4. GAS PRESSURE REGULATOR - SHALL BE PROVIDED UPSTREAM OF THE GAS VALVE TO PROVIDE REGULATED PRESSURE TO THE GAS TRAIN FROM THE GAS SUPPLY. THIS REGULATOR SHALL BE SUITABLE FOR A MAXIMUM OF 1 PSIG GAS PRESSURE. IF GAS PRESSURE EXCEEDS 1 PSIG, A GAS PRESSURE RELIEF VALVE SHALL BE FURNISHED AND UPSTREAM PRESSURE REGULATOR THAT IS OF THE FULL LOCKUP TYPE.
5. MANUAL SHUTOFF VALVES - SHALL BE PROVIDED UPSTREAME OF THE GAS REGULATOR TO MANUALLY CLOSE OFF THE GAS SUPPLY WHEN SERVICING THE GAS TRAIN OR ISOLATING THE BOILER. A SHUTOFF VALVE SHALL BE PROVIDED AT THE BURNER FOR TIGHTNESS CHECKING OF THE GAS VALVE.
6. COMBUSTION AIR PROVING SWITCH SHALL BE PROVIDED TO PROVE, PRIOR TO MODULATION THAT THE FAN IS OPERATING PROPERLY.
- H. FLAME SAFETY
1. FLAME SENSING SHALL BE ACCOMPLISHED WITH A FLAME ROD MOUNTED IN THE BURNER MOUNTING PLATE, DESIGNED FOR EASY REMOVAL FOR INSPECTION OR REPLACEMENT.
- 4.0 CONTROL PANEL

- A NEMA 1 TYPE ENCLOSURE IS FURNISHED AND LOCATED AT THE FRONT OF THE BOILER TO HOUSE THE FOLLOWING COMPONENTS:
- A. THE BOILER SHALL INCLUDE A COMPUTERIZED BOILER BURNER CONTROL WHICH SHALL BE AN INTEGRATED, SOLID STATE DIGITAL MICRO-PROCESSOR MODULATING DEVICE, COMPLETE WITH SEQUENCE INDICATION, FAULT RESET, MODE SELECTION, AND CONFIGURABLE PARAMETER SETTINGS. IT SHALL BE MOUNTED AT THE FRONT OF THE BOILER PANEL FOR EASY ACCESS AND VIEWING. THE CONTROLLER COMBINES FLAME SUPERVISION, BURNER SEQUENCING, MODULATING CONTROL, AND OPERATING LIMIT CONTROL.
- B. CONTROLLER SHALL PROVIDE FOR BOTH FLAME SAFEGUARD AND BOILER CONTROL AND SHALL PERFORM THE FOLLOWING FUNCTIONS:
1. BURNER SEQUENCING WITH SAFE START CHECK, PRE-PURGE, ELECTRONIC DIRECT SPARK IGNITION, AND POST PURGE, FLAME ROD TO PROVE COMBUSTION.
2. FLAME SUPERVISION. THE CONTROL SHALL PROVIDE PRE-PURGE AND POST- PURGE AND SHALL MAINTAIN A RUNNING HISTORY OF OPERATING HOURS, NUMBER OF CYCLES, AND THE MOST RECENT 15 FAULTS. THE CONTROL SHALL BE CONNECTED TO A TOUCHSCREEN DISPLAY INTERFACE THAT WILL RETRIEVE THIS INFORMATION.
3. SAFETY SHUTDOWN WITH DISPLAY OF ERROR.
4. MODULATING CONTROL OF THE VARIABLE SPEED FAN FOR FUEL/AIR INPUT RELATIVE TO LOAD REQUIREMENTS.
5. GAS PRESSURE SUPERVISION, HIGH AND LOW.
6. COMBUSTION AIR PROVING SUPERVISION.
7. HIGH AIR PRESSURE (BACK DRAFT TOO HIGH) SUPERVISION.
8. THE ACTIVE STEAM PRESSURE AND SET-POINT PRESSURE SHALL BE DISPLAYED AT ALL TIMES. OUTPUT SHALL BE MODULATING PID SET POINT CONTROL VIA ANALOG SIGNAL.
9. CONTROLLER SHALL BE CAPABLE OF MODBUS COMMUNICATION TO INTERFACE WITH PC OR BUILDING ENERGY MANAGEMENT SYSTEM.
- C. ALL PARAMETER INPUT CONTROL SET-POINTS SHALL BE FACTORY PRE-CONFIGURED WITH JOBSITE CONDITIONS PROGRAMMED AT THE TIME OF INITIAL OPERATION.
- D. DEMAND SWITCH.
- E. PROVIDE TERMINALS FOR CONTROL INTERFACE WIRING, CUSTOMER CONNECTIONS, AND CONNECTIONS FOR INCOMING POWER.
- F. INSTALL SOLID STATE CIRCUIT BOARDS FOR WATER LEVEL CONTROLS.
- G. SELECTABLE OPTIONS: ALARM LIGHT PACKAGE TO PROVIDE INDICATION OF LOW WATER, FLAME FAILURE, LOAD DEMAND, FUEL VALVE ON, INCLUDING A HORN WITH SILENCING FOR ALARM CONDITIONS.
- 5.0 PERFORMANCE
- THE PROPOSED BOILER SHALL PROVIDE THE FOLLOWING OPERATING PERFORMANCE TARGETS FOR NATURAL GAS:
- A. EFFICIENCY - FUEL TO STEAM EFFICIENCY SHALL BE GUARANTEED AT 85% FOR _____.
- 15# STEAM. FOR 150# STEAM OPERATING AT 125# THE GUARANTEED FUEL TO STEAM EFFICIENCY SHALL BE 83% AND 85% WITH OPTIONAL FLUE GAS ECONOMIZER. EFFICIENCY RATING SHALL ACCOUNT FOR RADIATION AND CONVECTION LOSSES.
- B. EMISSIONS - NOX EMISSIONS SHALL BE LESS THAN 20 PPM CORRECTED TO _____.
- 3% O2 AND LESS THAN 10 PPM CO OVER THE OPERATING RANGE OF THE BURNER TURNDOWN. IF EMISSIONS EXCEED THIS LEVEL, THE BOILER MANUFACTURER SHALL CORRECT AT THEIR EXPENSE UNTIL THIS LEVEL IS ACHIEVED ON A REPEATABLE BASIS.
- C. NOISE - SOUND SHALL NOT EXCEED 70 DBA AT HIGH FIRE WHEN MEASURED 3 FEET IN FRONT OF THE BURNER.
- D. RADIATION LOSSES SHALL BE LESS THAN 0.5% OF THE RATED INPUT AT MAXIMUM FIRING.
- E. STEAM QUALITY SHALL BE 99.5% AT MAXIMUM FIRING REGARDLESS OF OPERATING PRESSURE.
- 6.0 WARRANTY
- THE PACKAGE BOILER SHALL BE WARRANTED FOR A PERIOD OF ONE YEAR FROM DATE OF START-UP OR 18 MONTHS FROM SHIPMENT WHICHEVER SHALL OCCUR FIRST.
- 7.0 OPTIONAL ECONOMIZER PACKAGE
- FOR APPLICATION WITH 150# DESIGN MODEL CFH, AN ECONOMIZER PACKAGE SHALL BE _____.

FACTORY INSTALLED AND PIPED TO INCREASE OPERATING EFFICIENCY TO 85%. THE FACTORY INSTALLED PACKAGE SHALL INCLUDE AN ECONOMIZER COIL LOCATED IN THE REAR OF THE BOILER, INTEGRAL TO THE STACK OUTLET WITH INTEGRAL MAKE-UP WATER SUPPLY AND OUTLET PIPING. A VERTICAL STAINLESS STEEL FEEDWATER TANK COMPLETE WITH A CONTINUOUS RUNNING PUMP SHALL BE PROVIDED WITH INTEGRAL PIPING. THIS PIPING SHALL INCLUDE THE FEEDWATER MAKE-UP STOP VALVE, CHECK VALVE, AND ON/OFF ELECTRIC MAKE UP VALVE. THE MAKE-UP VALVE SHALL BE FACTORY WIRED TO THE ON/OFF PUMP CONTROL. FEEDWATER PIPING SHALL INCLUDE BY-PASS PIPING SO THAT WATER CIRCULATES THROUGH THE ECONOMIZER AT ALL TIMES.

SECTION 230500
BOILER FEEDWATER SYSTEM

- 1.0 GENERAL
- A. FURNISH AND INSTALL ACCORDING TO DRAWINGS AND MANUFACTURER'S INSTRUCTIONS THE QUANTITY OF CES-PRH-D PREHEAT BOILER FEED UNITS AS SHOWN ON THE DRAWINGS. EACH UNIT SHALL CONSIST OF (1) STEEL RECEIVER WITH A QUANTITY OF _____ BOILER FEED PUMPS, (1) DIRECT INJECTION STEAM HEATING ASSEMBLY, ELECTRICAL CONTROLS AND ACCESSORIES.
- B. THE BOILER FEED RECEIVER SHALL BE OF WELDED STEEL CONSTRUCTION, ELEVATED TO MEET THE NPSH REQUIREMENTS OF THE BOILER FEED PUMPS. HORIZONTAL WITH FLAT HEADS, SUPPORTED BY A STRUCTURAL STEEL FRAME AND HAVE A CAPACITY AS SHOWN ON THE DRAWINGS. RECEIVER MATERIAL AND THICKNESS SHALL BE AS SHOWN ON THE DRAWINGS. THE BOILER FEED RECEIVER SHALL BE EQUIPPED WITH THE FOLLOWING: (1) WATER LEVEL GAUGE, (1) DIAL THERMOMETER, (1) MAKE-UP WATER ASSEMBLY CONSISTING OF A 2-INCH EXTERNALLY ADJUSTABLE FLOAT SWITCH AND ELECTRIC SOLENOID VALVE, (1) LOW WATER CUT-OFF FLOAT SWITCH, (1) ISOLATION VALVE BETWEEN RECEIVER AND PUMP PLUS A VALVE IN EACH BLEED LINE INSTALLED FOR MAINTENANCE, AND (1) MAGNESIUM ANODE. A SUCTION ISOLATION VALVE SHALL BE INSTALLED IN THE SUCTION PIPING BETWEEN THE RECEIVER AND PUMP TO PERMIT SERVICING THE PUMPS WITHOUT DRAINING THE RECEIVER.
- C. ALL CONTROLS SWITCHES AND VALVES TO HAVE A NEMA _____ RATING.
- D. A CAST IRON BASKET INLET STRAINER WITH VERTICAL SELF-CLEANING BRONZE SCREEN SHALL BE PROVIDED FOR THE RECEIVER INLET.
- E. A DIRECT INJECTION STEAM HEATING ASSEMBLY SHALL BE INSTALLED IN THE RECEIVER. THE HEATING ASSEMBLY SHALL CONSIST OF A DOUBLE FLANGE MOUNTED INJECTION PIPE, STEAM CONTROL VALVE, TEMPERATURE REGULATION (PRESSURE REGULATOR FOR SYSTEMS OVER 15 PSIG STEAM PRESSURE), WYE STRAINER AND PRESSURE GAUGE. THE HEATING ASSEMBLY SHALL BE SIZED FOR THE CAPACITIES AS SHOWN ON THE DRAWINGS.
- F. THE MAKE-UP WATER ASSEMBLY SHALL BE SIZED TO EQUAL THE CAPACITY OF ONE OF THE BOILER FEED PUMPS. THE SOLENOID VALVE SHALL BE PACKLESS, PISTON PILOT-OPERATED WITH A CUSHIONED CLOSING AND HAVE AN EPOXY-RESIN MOLDED WATERPROOF COIL. THE VALVE SHALL BE EQUIPPED WITH A WYE STRAINER, AND A 3-VALVE MANUAL BYPASS.
- G. THE BOILER FEED PUMPS SHALL BE FLANGE MOUNTED ON THE RECEIVER SUCTION PIPING. THE PUMP SHALL BE CLOSE COUPLED VERTICAL DESIGN, AND SHALL HAVE A CAST BRONZE IMPELLER THAT IS BRONZE FITTED TO THE CAST IRON PUMP HOUSING WITH A RENEWABLE BRONZE WEARING RING. THE MECHANICAL SEAL SHALL BE RATED FOR 250FT SERVICE. THE ENTIRE PUMP ASSEMBLY SHALL BE PERMANENTLY ALIGNED AND DYNAMICALLY BALANCED TO DELIVER ITS FULL RATED CAPACITY. THE PUMP SHALL BE DRIVEN BY AN INDUSTRY STANDARD MOTOR AVAILABLE "OFF THE SHELF." THE MOTOR SHALL HAVE A NEMA STANDARD SHAFT. THE HORSEPOWER AND ELECTRICAL CHARACTERISTICS SHALL BE AS SHOWN ON THE DRAWINGS.

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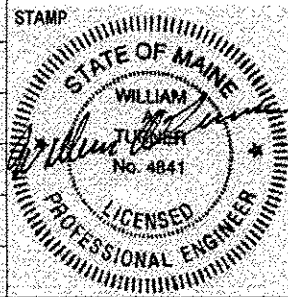
**MDOT MAINTENANCE BUILDING
BOILER REPLACEMENT**

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SHEET TITLE:
**SPECIFICATIONS
SHEET 4 OF 4**

M4.4